WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2005CA123B

Title: Do Constructed Flow-Through Wetlands Improve Water Quality in the San Joaquin River?

Project Type: Research

Focus Categories: Wetlands

Keywords: Wetlands, Water Quality, San Joaquin River

Start Date: 03/01/2005

End Date: 02/28/2006

Federal Funds: $20,000

Non-Federal Matching Funds: $37,201

Congressional District: 44

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Abstract

Communities from all walks of life rely on the San Joaquin River (SJR) as a natural, municipal, and agricultural resource, and as a result, it has become one of the most human-manipulated watersheds in the world. The Basin drains a seven-million-acre watershed having diverse land-use practices including forestry, rangeland, irrigated agriculture, wildlife refuges, dairies, municipalities, and industry. The River appears on California's 303(d) list of impaired waters because it frequently exceeds water quality objectives for dissolved oxygen, dissolved organic carbon, pesticides, salts, sediment and nutrients. Poor water quality is a result of runoff and/or discharge from irrigated agriculture, dairies, industry and municipalities and is a threat to the overall health and integrity of Central Valley River-Bay-Delta aquatic ecosystems. Downstream portions of the river experience multiple episodes of low dissolved oxygen (DO) that may act as a barrier to upstream migration of spawning Chinook salmon, striped bass and other anadromous fish species.

Previous studies have identified algal biomass as the most significant oxygen-demanding substance in the upper SJR. Algal biomass is not a conserved substance, but grows and

decays in the SJR in response to growth limiting factors such as nutrients, light, temperature and residence time; hence, characterization of oxygen-demanding substances in the SJR is inherently complicated. As the algae are transported downstream they die and decompose resulting in critically low DO concentrations. In addition, other water quality contaminants can stimulate both positive and negative feedback mechanisms affecting algal growth. For example, a high amount of suspended solids is considered a water quality concern, yet it can result in light liming conditions slowing growth rates of algal populations. We will attempt to document how constructed wetlands influence these feedback mechanisms and their impacts on water quality (DO TMDL specifically) in the SJR.

The primary goal of this study is to evaluate the efficacy of utilizing constructed wetlands to enhance water quality in the SJR. The objectives are to: (1) determine the effect of constructed wetlands on nutrient and food resource concentrations, including N, P, electrical conductivity, DOC, and dissolved oxygen; (2) identify relationships between algal growth rates and nutrient dynamics in the wetland environment; and (3) estimate input/output fluxes (source/sink) of nutrients, suspended solids, dissolved organic carbon and food resources from constructed wetlands.

This proposed project directly matches the water quality priority research area of the UC Center for Water Resources. Data from the proposed study will contribute to improved understanding and prediction of: (1) factors regulating algae growth dynamics in the SJR; (2) effects of flow-through wetlands on water quality; and (3) management options for addressing hypoxia in the lower SJR and Stockton Ship Channel. This information is of concern for many policy makers including the USDA-NRCS, Bureau of Reclamation, and the State Water Resources Control Board.